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RECENT USSR WORK ON THE MODIFICATION OF VIRUSES

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Many instances are known when a virus which has been passed through an animal that has a superior resistance to it changes its hereditary characteristics and becomes harmless to humans. Thus, the virus of measles, on being passed through rabbits, loses its pathogenicity to humans. The virus of sandfly fever (pappataci fever) likewise changes its characteristics on being inoculated in chickens. However, it is often difficult to find the proper intermediate animal in which the virus will be modified in the desired manner, i. e., be changed in such a way that it will no longer produce the disease in humans, but at the same time remain an effective immunizing agent that will prevent infection of humans and animals with the disease in question. For instance, the virus of influenza changes its characteristics so profoundly on being passed through mice that it loses the capacity to propagate in the human body and becomes unsuitable for use as a living vaccine against human influenza.

Under the circumstances, methods of growing viruses in tissues of malignant tumors and in developing chicken embryos become of considerable importance. A great number of investigations carried out in recent years by USSR scientists have established that many viruses propagate in cells of malignant tumors. If the virus of tick encephalitis has been injected into a white mouse which has a cancerous tumor, it propagates very rapidly in that tumor. The virus

of tick encephalitis that has not been modified affects the cerebral tissue of mice just as it does that of humans. The animals, on being infected with this disease, invariably die of it. After the virus has been introduced into the cancerous tumor of a mouse, it will initially peretrate from the tumor into the brain and kill the animal. However, if 10-20 reinoculations from tumor to tumor have been carried out, the virus modified its properties and will no longer kill animals when introduced either into a tumor or into the brain directly.

The modified virus is not only innocuous to mice, but also protects them from infection with the natural, unchanged virus of tick encephalitis. The problem which faces scientists at present is to investigate the possibility of applying the modified virus in order to protect humans from infection with tick encephalitis. Work of this type must be carried out under strict observance of every precaution; the virus should be tested on monkeys before it is used on humans.

Prior to launching investigations of this type, it is necessary to find ways of fixing the newly acquired properties of the virus in such a manner that they will be retained permanently. We know that pathogenic viruses preserve their characteristics indefinitely if they develop in a medium to which they are adapted by heredity. As far as modified viruses are concerned, it was found that they retain their newly acquired, useful characteristics if they are cultivated in chicken embryos. Chicken embryos are used in all laboratories throughout the world as a convenient medium for growing viruses. However, USSR scientists were the first to discover that this medium has the property of fixing newly acquired characteristics and preserving them for an indefinite length of time.

Attempts to obtain viruses with modified heredity were undertaken not only with regard to tick encephalitis. A group of workers at our laboratory (Institute of Virusology imeni D. I. Ivanovskiy, Department of Hygiene, Microbiology, and Epidemiology, Academy of Medical Sciences USSR) conducted similar investigations on the virus of Japanese encephalitis as well as other viruses. In the experiments in question, which were repeated many times, the same positive results were obtained. In addition to that, the virus of Japanese encephalitis was introduced into the organism of puppies, kittens, chicks, and pigeons. The results of these experiments differed from each other; no matter how similar the organisms in which the virus of Japanese encephalitis was cultivated, the properties of this virus were modified in every instance.

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